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JOINT INVENTORS

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APPLICATION FOR UNITED STATES LETTERS PATENT

SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

Be it known that we, MARGARET SZCZERBA, a United States citizen, residing at 1049 Hill Crest Drive, Carol Stream, Illinois, 60188;
KATHY PLAMBECK, a United States citizen, residing at 202 Coachline Trail, Carol Stream, Illinois, 60188; and
RICHARD JOHNSON, a United States citizen, residing at 608 Tuggles Court, Batavia, Illinois, 60510, have invented new and useful POLYMERIZED WAX CANDLES, of which the following is a specification.

POLYMERIZED WAX CANDLES

TECHNICAL FIELD

Candles comprising a wax base and a copolymer of synthetic thermoplastic rubber copolymer additives are disclosed. The copolymer additive is useful for binding excess oil within the candle thereby allowing for the production of quality candles from less expensive base wax. Methods of manufacturing candles comprising a wax base and a copolymer of synthetic thermoplastic rubber additives are also disclosed.

BACKGROUND OF THE RELATED ART

Candles have long since been used as an accepted method of giving light, heat, scent, or for celebration or votive purposes. Candles made from a variety of wax bases are well known within the art. Typically, a wax base is derived from petroleum sources, vegetable sources, animal sources, synthetic sources, or some mixture thereof. The wax materials of candles are typically of high quality having a low amount oil therein. A low amount of oil within the candle is associated with a high quality candle.

Despite the low costs of using crude wax as a wax base, high quality candles produced from crude wax are expensive because the crude wax must be refined into higher quality wax. During the refining process, a crude wax, which may include as much as 20% oil is heated to drive off the oil. The process of driving off the oil also consumes some of the wax. Therefore, a large amount of crude wax is required to obtain a small amount of high quality wax. The large amounts of crude wax and the high costs of refining that crude wax drive up the costs of producing high quality candles.

Due to the low costs of crude wax, it would be desirous to devise a method of producing high quality candles using crude wax. To do this, it is necessary to determine alternate methods of binding or otherwise disposing of the oil that is inherent in crude wax. Currently, no methods, other than expensive refining processes, are available to remove the oil from crude wax.

SUMMARY OF THE DISCLOSURE

In satisfaction of the aforenoted needs, an economic method of binding the oil that is inherent within a crude wax or economical wax source is disclosed. The oil within the crude wax is economically bound through the use of a copolymer additive. By adding this copolymer to crude wax, high quality candles can be produced using less expensive crude wax as a starting material.

The copolymer additive which is based on synthetic thermoplastic rubbers may be diblock, triblock, radial block or a combination thereof. Copolymers of this type are well known, and are typically used as adhesives, sealants and coatings. For example, synthetic thermoplastic rubber copolymers produced under the tradename KRATON® are used in a variety of environments.

A candle utilizing a wax base and a synthetic thermoplastic rubber copolymer is also disclosed. The wax base may come from economical sources such as petroleum sources, vegetable sources, animal sources, synthetic sources or mixtures thereof. Further, the wax base may or may not be classified as a "crude wax". The copolymer used in conjunction with the candle may be a diblock, triblock, radial block, or combinations of diblock, triblock and radial block copolymers. The addition of the copolymer to the wax base binds the oil within the wax, thereby permitting the production of candles with more cost effective materials. It is therefore an object of the invention to prepare candles with lower cost waxes which are presently unable to be used in candle-making preparation.

One of the lower cost waxes that are presently not useful in the candle making process are low-melt waxes. Despite their lower cost, these low-melt waxes are not used prevalently because they may melt during shipping during hot months. The addition of the copolymer stabilizes these low-melt waxes, by raising the melt temperature. Thus, if low-melt waxes are used, the concern over melting during shipping is obviated by the addition of the copolymer according to the invention.

As an additional method of cost savings, candles produced according to this invention reduce processing times and percent defects. Moreover, the candles can be

produced using standard candle manufacturing facilities. As such it is an object of this invention to produce candles utilizing an optimized manufacturing process.

In addition to the cost saving benefits, the addition of the copolymer has been found to alter the crystalline structure of the wax bases thereby allowing for the manipulation of the burn rate of the candles. The burn rate manipulation is achieved because the altered crystalline structure provides multiple temperature gradients throughout the candle. It is therefore an object of the invention to provide candles that have longer burn times than conventional candles. In addition to longer burn times, the multiple temperature gradients of the candle provides safety benefits by preventing spillovers because the edges of the candle are substantially cooler than the center pool.

Finally, the disclosed candles are useful for suspending a variety of safety and aesthetic additives. For example, flame retardants can be suspended to extinguish the candle at the desired point. Glitter and other aesthetic additives may also be suspended in the candle.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

A candle made of a composition having a wax source and a thermoplastic copolymer is disclosed. The copolymer is present in an amount of ranging from about 0.125% by weight to about 10% by weight. Preferably, the copolymer is present in an amount ranging from about 0.25% by weight to about 2% by weight.

The copolymer is based on synthetic thermoplastic rubbers, and may be diblock, triblock, radial block or a combination of the three. The synthetic thermoplastic rubbers which are produced under the KRATON® tradename are useful in this invention. The Kraton® rubber polymers, which are produced by the Shell Chemical Company, are elastomers with a high strength and low viscosity. Additionally, KRATON® has a unique molecular structure of linear diblock, triblock or radial polymers. Each molecule of the KRATON® rubber is believed to consist of block segments of styrene monomer units and rubber monomer units and each block segment may consist of 100 monomer units or more. The most common structure is the linear ABA block type; styrene-butadiene-styrene (SBS) and styrene-isoprene-styrene (SIS), the KRATON® D series. A second generation polymer of this series is the KRATON® G series which are styrene-ethylene-butylene- styrene type (S-EB-S)

polymers. Diblock polymers include the ABA type and the SB, styrene-ethylenepropylene (S-EP) and (S-EB). The AGA structure of the KRATON® rubber molecule has polystyrene endblocks and elastomeric midblocks. This series of polymers is sold commercially and indicated as being major compounding ingredients or additives in adhesives, sealants and coatings, asphalt modifications for roads and roofing, polymers modification, thermoset modification, and oil modification including use as viscosity index improvers, greases and gels. The KRATON® G rubbers are indicated as being compatible with paraffinic and naphthionic oils and the triblock copolymers are reported as taking up more than 20 times their weight in oil to make a product which can vary in consistency from a "Jello" to a string elastic rubbery material depending on the grad and concentration of the rubber.

The ability of a synthetic thermoplastic rubber copolymer to bind oil allows for the use of inexpensive alternatives for the fuel source or wax base. For example, in the case of paraffinic waxes, instead of using wax that has had all of the oil burned off through the expensive refining process, the inexpensive "slack wax" can be used. Normally, the use of "slack wax" would not produce a candle of suitable quality because of the oil present therein. However, by blending the "slack wax" with the appropriate amount of the synthetic thermoplastic rubber copolymer, the oil is bound. Thus, a high quality candle can be produced from a relatively inexpensive wax source.

Moreover, the addition of the synthetic thermoplastic rubber to a wax base of a candle improves the shipping characteristics of the candle. Often, candles that are prepared with a lower quality wax are damaged by heat during hot shipping months. This problem is overcome in candles that utilize the synthetic thermoplastic rubber copolymer according to the invention. The reason for this is that the copolymer actually works to raise the melt temperature of the wax base. As such, the addition of the copolymer to a wax base reduces the concerns of shipping candles in hot months.

The wax base used in the candle composition is a fuel source. The wax base may come from a variety of sources. For example, the wax base may be made from petroleum sources, vegetable matter, animal-fat matter, synthetic matter, or a combination thereof. Other sources may also be used so long as they are useful as a

fuel source. Preferably, the wax base is present in the candle composition in an amount greater than 50 percent by weight.

The candle composition may also include other additives such as fragrances, stabilizers, dyes and hydrocarbon oil. Fragrances may be added in an amount up to about 10 weight percent. Stabilizers may be added in an amount of up to 1 percent by weight. Dyes may be added in an amount of up to 2 percent by weight. Finally, hydrocarbon oil may be added in an amount of up to 10 percent by weight.

Candles prepared from compositions according to this disclosure are made in a conventional manner. The candles will include a body portion and at least one wick that is disposed within the body. Depending on manufacturing capabilities, the body of the candle may be formed in a variety of different shapes and sizes. Additionally, multiple wicks may be found within the candle.

Burn testing of candles made in accordance with this disclosure reveals that the addition of the synthetic thermoplastic copolymer to the wax base alters the crystalline structure of the wax base thereby allowing for dynamic and unexpected burn characteristics. One such characteristic is revealed by thermal photography. When candles are lit, they typically produce a wax pool in the area immediately adjacent the wick. The liquefied wax that becomes the fuel for the candle to maintain its flame. Thermal photography reveals that candles that are not produced according to the invention demonstrate sharp temperature gradients. For example, when lit, the area immediately adjacent to the wick can burn at temperatures up to 176°F. The next temperature gradient drops sharply to 140°F. This sharp temperature drop may cause the size of the wax pool to rapidly expand radially. This may lead to the dangerous situation of wax spillover. Candles produced according to the disclosure, however, minimize the risk of spillover because the addition of the synthetic thermoplastic copolymer alters the crystalline structure of the wax base thereby allowing for a much smoother temperature gradient transition within the candle. This gradual temperature reduces the probabilities of wax spillovers because a natural well is formed for the wax to settle in.

One method of preparing begins by heating the wax base to a temperature within the range 170°F to 220°F. After heating, the copolymer additive is mixed in

for 30 minutes or until homogeneous. Upon the completion of mixing, the batch is cooled to 170°F, whereupon the desired additives, such as stabilizers, dyes, hydrocarbon oils, fragrances, etc., can be added. After the addition of the additives, the entire composition should again be mixed until it is homogeneous. Preparation of the candles is completed when the composition is poured into molds at 170°F.

An alternative method of preparing candles includes the initial step of preparing a copolymer pre-mix in lieu of mixing the full amount of copolymer into the full amount of wax base. This pre-mix may contain from about 1% to about 49% by weight copolymer, and about 51% to about 99% wax base. Due to the fact that the viscosity of the copolymer pre-mix is directly related to the amount of copolymer present, it is preferable to use a pre-mix containing from about 8% to about 12% by weight copolymer, and about 88% to about 92% wax base. The pre-mix is prepared by first heating the requisite amount of wax base to a temperature within the range of about 190°F to about 220°F. After heating the wax, the next step is to add in half of the copolymer. That composition is then mixed until the copolymer is in solution. The remaining copolymer is then added in and mixed until the entire solution is homogeneous.

Preparation of the final candle composition using the copolymer pre-mix is very similar to the preparation without the copolymer pre-mix. The only difference is that instead of mixing the copolymer into the heated wax base directly, the copolymer pre-mix is added to the heated wax base. Thus, the first step is to heat the wax base to a temperature within the range of about 170°F to about 220°F. After heating, the copolymer pre-mix is mixed in for 30 minutes or until homogeneous. Upon the completion of mixing, the batch is cooled to 170°F, whereupon the desired additives, such as stabilizers, dyes, hydrocarbon oils, fragrances, etc., can be added. After the addition of the additives, the entire composition should again be mixed until it is homogeneous. Preparation of the candles is completed when the composition is poured into molds at 170°F.

The aforementioned preparation methods can be employed using standard candle manufacturing facilities. Moreover, candles produced according to the invention reduce processing times and percent defects. These added benefits work to

further reduce the costs of producing candles.

EXAMPLE 1

A candle having a wax base made from petroleum matter was prepared in accordance with the described protocol. The wax base is about 78.75% by weight of the candle composition. Paraffin wax sold by Exxon/Mobil under the trade name Parvan® 129 and micro-crystalline wax sold by Bareco Products under the trade name Be Square® are examples of the types of petroleum matter that may be used to prepare the wax base according to this example. The synthetic thermoplastic rubber copolymer used in this example is a styrene-ethylene-styrene block copolymer. Sold by Shell Chemical Company under the tradename KRATON® 1652, the synthetic thermoplastic rubber copolymer is present in an amount of about 5% by weight. Additionally, stearic acid, sold under the tradename Emersol® 7036 by the Cognis Company, may be present in an amount of about 1% by weight. Other polymers, such as polyethylene sold under the trade name Vybar® 103 by Baker-Petrolite is also present in an amount of 1% by weight. Finally, fragrances and dyes can also present. For example, fragrances such as coconut creme sold by J. Manheimer may be present in an amount of about 5% by weight. Similarly, a dye such as Nitro Fast Blue 2B Powder, sold by the Clariant Corporation, may be present in an amount of about 0.25% by weight.

EXAMPLE 2

A candle with a wax base made from vegetable matter is prepared in accordance with the described protocol. The wax base is present in an amount of about 99% by weight, and may be vegetable fatty acids, soybean wax, beeswax or other vegetable based sources. Additionally, a synthetic thermoplastic copolymer such as styrene-ethylene-styrene block copolymer, is also present in an amount of about 1% by weight. KRATON®1652 sold by the Shell Chemical Company is a suitable example of such a copolymer

EXAMPLE 3

A candle with a wax base made from animal-fat matter is prepared in accordance with the described protocol. The wax base is present in an amount of about 98% by weight. Suitable animal-fat sources include tallow base fatty acids. Additionally, a synthetic thermoplastic copolymer such as KRATON® 1652 is also present in an amount of about 2% by weight.

EXAMPLE 4

A candle with a wax base made from synthetic matter is prepared in accordance with the described protocol. The wax base is present in an amount of about 92% by weight. The synthetic sources that may be used as a wax base include, among others, synthetic paraffin waxes such as Callista 122 made by the Shell Chemical Company, and alpha olefins. Additionally, a synthetic thermoplastic copolymer such as KRATON® 1652 is also present in an amount of about 8% by weight.

EXAMPLE 5

A candle with a wax base made from a mixture of vegetable and petroleum matter is prepared in accordance with the described protocol. The wax base is made of about 55% vegetable matter such as soy and about 45% petroleum matter such as paraffin. The wax base makes up about 99% of the candle composition. The remaining about 1% is made up of a synthetic thermoplastic copolymer such as KRATON® 1652.

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof.